FRD Activities Report
October 2000

Research Programs

VTMX-CBNP 2000

The VTMX-CBNP 2000 study field deployment was a resounding success. The study was even reported in the news papers and on the radio. An Associated Press reporter and photographer visited our field headquarters. News articles subsequently appeared in the *Deseret News*, a local Salt Lake City newspaper, and also made national news in *USA Today*. Some local Idaho newspapers attempted to grab readers attention with headlines that read "Gas attack tests on Salt Lake." An example newspaper article is shown below. This notoriety probably heightened suspicions of the local police, who destroyed one of our bag samplers during the final test, thinking it was a bomb. Nevertheless, FRD's contribution to the program went almost without a hitch.

From, left, NOAA scientists Mark Hoover, Dianne Hoover, Joyce Silvester and Jeff French, prepare air sampling monitors to be set around the city Wednesday, Oct. 25, 2000.

Defense agency studying potential Olympic threat

By Paul Foy
Associated Press

SALT LAKE CITY — A U. S. defense agency is in Salt Lake City testing its ability to track the movement of deadly chemical or industrial gases — a potential threat being assessed by security planners for the 2002 Olympic Games.

The Defense Threat Reduction Agency is monitoring the flow of a harmless gas being released over the Salt Lake Valley this month for a weather study.

It is taking advantage of the Olympic-related study of tricky weather patterns in this mountain-rimmed city, where winter inversions can trap cold, stagnant air — or worse — near ground level. The weather study involving several other federal agencies also aims to improve snowfall forecasts for the Winter Games.

"We are piggybacking on their efforts," Capt. Bob Bennett, a spokesman for the Defense Threat Reduction Agency, said Thursday. "It's a story of more bang for the buck."

The mission of the Defense Threat Reduction Agency is to detect and predict the spread of chemical and biological attacks and give American troops an early heads-up.

One phase of the weather study now under way involves the release of a nontoxic gas, sulfur hexafluoride, over the Salt Lake valley. The tracer gas is helping scientists measure swirling air motions.

The Defense Threat Reduction Agency is using its computers to track the heavy gas as it flows through Salt Lake City and penetrates buildings by way of ventilation ducts and open doors and windows. The results are expected to help the agency better predict the movements of the deadly gases under variable weather conditions.

"We're fine-tuning our models and making them more accurate in an urban environment," Captain Bennett said.

William Alder, the Salt Lake meteorologist in charge for the National Weather Service, said the October phase of the weather forecasting study is being conducted as a benchmark of tranquil weather between summer and winter.

Bennett emphasized that the Defense Threat Reduction Agency can put its technology to use for more than military objectives. It can measure diesel fumes and industrial emissions and warn of accidental releases of deadlier gases.

Associated Press news release appearing October 23, 2000.

During the month of October, we conducted six different nocturnal tests consisting of sulfur hexaflouride tracer releases, together with real-time and whole-air tracer sampling and analysis. These tests were conducted in downtown Salt Lake City and the surrounding urban area out to a distance of 6 km from the release site. Six mobile analyzers were employed for the study, as were 130 whole air samplers with 12 sample containers each. We also supplied two sonic anemometers for measurement of the complex wind flow around the buildings at the release site. At times, nearly the entire FRD staff was in Salt Lake City. The "can do" attitude of the FRD staff ensured the success of this deployment, and the sponsors are requesting our participation in the next CBNP field study. (Kirk.Clawson@noaa.gov, and staff)

The 915-MHz radar wind profiler and phased-array Doppler sodar was deployed on October 3 in a open parking lot on the grounds of the Raging Waters entertainment complex . This site, southwest of downtown Salt Lake City, was secured for the VTMX-CBNP 2000 field study. The radar was configured to acquire one-hour wind profiles in a dual mode. The first mode acquires high resolution (~60 m) wind profiles over a limited range (~ 2 to 3 km) while the second mode acquires low resolution (~100 m) wind profiles over a higher range (~ 4 to 5 km). The Doppler sodar was configured to acquire 15-min wind profiles from near the surface to about 300 m with a 20 m resolution. In addition, a 10-m tower was installed for the measurement of wind speed, wind direction, air temperature, and relative humidity. All of these instruments worked exceptionally well during VTMX-CBNP 2000. Unfortunately, the windows of the electronics trailer were smashed by rocks thrown by vandals. In addition, the doors to the electronics trailer were severely damaged by these rocks as well. On a lighter note, a golf ball was found inside the Doppler sodar. Fortunately, none of the acoustic transponders were damaged in this apparent "hole-in-one" that originated from the Glendale Golf Course south of the monitoring site. (Jerry.Crescenti@noaa.gov)

Jerry Crescenti standing near the radar wind profiler and the Doppler sodar

Instrument and computer upgrades were performed on the LongEZ data system in preparation for VTMX 2000. The upgrades included modifications to the BAT-REM/computer interface to use commercially available PC boards for data collection from the remote AQ cards. Also, new Ashtech GPS sensors were fully integrated into the MFP system. These sensors replace the Novatel GPS cards and will provide higher accuracy in both GPS position and velocity, utilizing precision code in two frequencies. (Jeff.French@noaa.gov, Ed Dumas)

Refractive Turbulence Study

The design and construction of the second generation of the FRD Fast, Ultra-Sensitive Temperature (FUST) probe has been completed. The new design eliminates the housing that acted as an expansion chamber to reduce the flow speed passing the sensor. Flight tests conducted earlier this year indicated that the housing did not improve dramatically our ability to recover temperature. The electronics in the new design remain essentially unchanged. They are contained within a 1 inch copper cylinder, 15 inches in length. The primary sensing element is a 1/1000 inch Cu-Co

Jeff French, Tim Crawford and Shane Beard examining the FUST probe

thermocouple with a reference junction tied to micro-bead with large thermal mass. The element is exposed to the free stream, roughly 6 inches in front of the electronics section of the probe. Flight tests are to be conducted in early November, with a second round of measurements to be made for RTS-2000 during November and December. We believe the upgrades to the probe will allow us to measure temperature resolution to 0.005 C with a response time of 0.01 s. Such high resolution and response is necessary for understanding turbulence spectra from the upper regions of the troposphere. (Jeff.French@noaa.gov, Tim_Crawford, Randy Johnson, Shane Beard)

Cooperative Research with INEEL

Fourteen new relative humidity sensors were added to the INEEL Mesoscale Meteorological Network this fall. All 33 towers in the network will now report 5-minute relative humidity averages along with their other measurements. (Roger.Carter@noaa.gov, Randy Johnson, Tom Strong)

INEEL Mesoscale Modeling

The output files from the MM5 simulations of Southeast Idaho currently require about 230 Mbytes of disk space for each day the model is run, including the output from all three of the defined grids. A program has been developed to reduce the output to a more manageable size. This program converts the output to a NetCDF format that uses scaled 2-byte integers instead of 4-byte floating-point values. A further reduction in size is obtained by excluding some output variables that are of little interest. Finally, the NetCDF files are compressed using the bzip2 utility. The end result is that a single day's simulation occupies about 40-45 Mbytes. This allows about two weeks of simulations to be stored on a single CD-ROM. (Richard.Eckman@noaa.gov)

Other Activities

Eleventh Symposium on Meteorological Observations and Instrumentation

Three meteorology students have been given grants of $500 each to help defray travel costs to attend the Annual Meeting of the American Meteorological Society (AMS) in Albuquerque, New Mexico from January 14-19, 2001. As the chair of the AMS Measurements Committee, Jerry Crescenti identified students who have written papers for the Eleventh Symposium on Meteorological Observations and Instrumentation (SMOI) that deal with instrument development or observation techniques. On behalf of the AMS, Crescenti was able to offer travel assistance. These students include:

- Jerald A. Brotzge, University of Oklahoma, for his papers entitled *closure of the surface energy budget at 10 OASIS super sites* and *the OASIS Project Network for monitoring the surface energy budget;*

- V. Sridhar, Oklahoma State University, for his paper entitled *estimating downwelling longwave radiation for input to a land surface model;*

- Robert C. Gilliam, North Carolina State University, for his paper entitled *qualitative observational analysis of the boundary layer structure using surface-based tower and remote sodar data*.

In addition, Crescenti reviewed eighteen student travel grant applications that were submitted to the AMS to attend the SMOI. Each student submitted a short essay as to why he/she should be given the expense-paid opportunity to attend the meeting. Crescenti recommended that at least eight of the eighteen students be given travel assistance by the AMS to attend the SMOI.

Delivery of Census Computers

FRD took delivery of the excessed census computers at the end of the month. The lot included 11 Pentium II 450 MHz computers each with 17 inch monitors and 1 Pentium III 500 MHz server. Four HP 8000 series printers were also included. These computers are being put to good use, replacing aging 486 Inelviz computers, many of which are more than 10 years old. (Brad.Reese@noaa.gov)

Awards

Tim Crawford, Jerry Crescenti, and Jeff French were awarded NOAA bronze medals this month. This prestigious award was given to the ARL air-sea interaction research team for design and application of a novel airborne instrument system to advance scientific knowledge of air-sea interaction. Tim Crawford accepted the bronze medal on behalf of the team at the NOAA Awards Ceremony on October 19 at the University of Maryland in College Park, Maryland. (Tim.Crawford@noaa.gov, Jerry Crescenti, and Jeff French)

Roger Carter received a cash-in-your account award for redesigning the real-time SF6 analyzers making them much more easy to install, safer and less prone to failure. He simplified the instrument mounting and data acquisition system. He made calibration of the instrument much more automated and repeatable, thereby allowing for better determination of instrument response and error.

Jerry Crescenti and Jeff French received a cash-in-your account awards for their contributions to the ARL air-sea interaction research team.

Papers

Mahrt, L., D. Vickers, J. Sun, T. L. Crawford, and G. H. Crescenti. 2000. Surface stress in offshore flow and quasi-frictional decoupling. *J. Geophys. Res.,* submitted.

Watson, T. B., R. Johnson, M. L. Pitchford, M. Green, H. Kuhns, V. Etyemezian. 2000. The Perfluorocarbon Tracer Releases During the Big Bend Regional Aerosol and Visibility Observational (BRAVO) Study. NOAA Technical Memorandum OAR ARL-237, 36 pp. Received from printer

Travel

Tom Strong and Wayne Hooker traveled to Santa Margarita, California to dismantle the radar profiler and Doppler sodar used in the Central California Ozone Study (CCOS). The radar and sodar was transported to Salt Lake City where they met Jerry Crescenti. The three of them set up the radar wind profiler, Doppler sodar, and a 20-m tower at the Raging Waters entertainment complex before returning to FRD in Idaho Falls.

Tim Crawford traveled to College Park, Maryland October 18-20 to attend the 2000 NOAA Bronze Medal Awards Ceremony. He also visited John Gaynor in OAR's Office of Scientific Support.

Kirk Clawson, Tim Crawford, Roger Carter, Jeff French, Wayne Hooker, Neil Hukari, Randy Johnson, Debbie Lacroix, Brad Reese, Richard Eckman, and Joyce Silvester traveled to Salt Lake City in October to participate in the Downtown Tracer Experiment of VTMX-CBNP 2000.
A total of four trips were made to Salt Lake City to conduct six tests during the month of October.

Visitors

Ed Dumas (ATDD) visited for one week for preparation of the LongEZ data system and instruments for VTMX.

Training

In-house training in the operation of the TGA continuous gas analyzers and the whole air samplers was held on September 27-28 for the those participating in the VTMX study in October.